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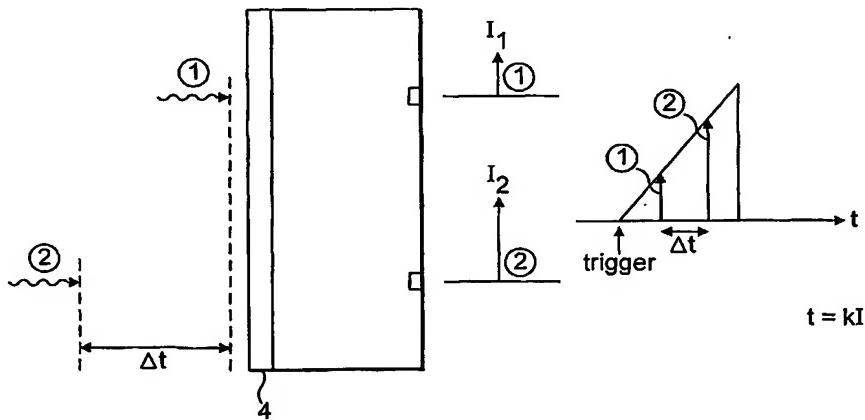
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(54) Title: PHOTON ARRIVAL TIME DETECTION



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(57) Abstract: A photon arrival time detector has the form of a photocathode (4) from which a photoelectron is ejected by an incident photon. The photoelectron is accelerated by an applied voltage to a CCD sensor (6). The voltage between the photocathode (4) and the CCD sensor (6) is time varying such that the arrival energy of the electron at the CCD sensor (6) depends upon the time of its arrival at the photocathode (4). Thus, the arrival time of the photon is represented by the intensity of the pixel event recorded by the CCD sensor (6).

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 GO1S H01J GO1N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|-----------------------|
| A | US 6 121 600 A (ESTRERA JOSEPH PAUL ET AL) 19 September 2000 (2000-09-19) abstract column 5, line 59 – column 6, line 47 | 1,15 |

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|--|------------------|----------------|--------------------------------------|--|--|
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